

**CLAIMS**

- 1 1. A golf club comprising:  
2 a 6DOF inertial measurement unit disposed within the head of the golf club; and  
3 a microprocessor in communication with the 6DOF inertial measurement unit, the  
4 microprocessor configured to receive data from the 6DOF inertial measurement unit and  
5 determine the translational and rotational motion of the head of the golf club.
- 1 2. The golf club of claim 1, wherein the head of the golf club comprises a putter  
2 head.
- 1 3. The golf club of claim 1, wherein the head of the golf club comprises one of an  
2 iron and a wood.
- 1 4. The golf club of claim 1, wherein the microprocessor is configured to determine  
2 the motion of the head of the golf club using a Quaternion algorithm.
- 1 5. The golf club of claim 1, wherein the microprocessor is configured to determine  
2 the motion of the head of the gold club using an Euler angle algorithm.
- 1 6. The golf club of claim 1, further comprising:  
2 a kinematic reference model stored in memory;  
3 wherein the microprocessor is further configured to compare the motion of the  
4 head of the golf club to the kinematic reference model.

1     7.     The golf club of claim 1, wherein the golf club comprises a putter and the  
2     microprocessor is further configured to determine whether the head of the putter rotates  
3     beyond a certain threshold during a putting stroke.

1     8.     The golf club of claim 1, wherein the golf club comprises a putter and the  
2     microprocessor is further configured to determine whether, during a putting stroke, the  
3     head of the putter deviates from the target line by a predetermined threshold.

1     9.     The golf club of claim 6, wherein the golf club comprises a putter and the  
2     microprocessor is further configured to:  
3         determine the acceleration of the head of the putter through impact of the ball; and  
4         provide feedback based on the determined acceleration.

1     10.    The golf club of claim 1, further comprising a feedback mechanism in  
2     communication with the microprocessor, the feedback mechanism configured to provide  
3     information to a user of the golf club based on the comparison of the motion of the head  
4     of the golf club and the kinematic reference model.

1     11.    The golf club of claim 10, wherein the feedback mechanism comprises a display.

1     12.    The golf club of claim 10, wherein the feedback mechanism employs an audio  
2     cue.

1     13.     The golf club of claim 1, further comprising a distance/elevation calculation  
2     functionality comprising logic configured to determine the distance/elevation between a  
3     first position and a second position based on the movement of the head of the golf club  
4     from the first point to the second point.

1     14.     The golf club of claim 13, wherein the golf club is a putter and further comprising:  
2     logic configured to determine, based on the movement of the head of the putter  
3     during a putting stroke, at least one of the following distances: the drawback distance of  
4     the head of the putter and the follow-through distance of the head of the putter; and  
5     logic configured to compare at least one of the drawback distance and the follow-  
6     through distance to the travel distance of the ball struck by the head of the putter.

1     15.     The golf club of claim 1, wherein the golf club comprises a putter and further  
2     comprising a Stimpmeter functionality comprising logic configured to calculate the  
3     “speed” of a green based on the impact velocity of the putter head and the resulting  
4     distance the golf ball travels on the green.

1     16.     The golf club of claim 15, wherein the microprocessor is further configured to  
2     calculate an amount of “break” to be applied by a golfer based on an orientation of the  
3     face of the putter at address relative to a ball-to-hole line.

1     17.     The golf club of claim 1, wherein the microprocessor is further configured to  
2     determine the motion of the head of the golf club by performing a gravity cancellation  
3     algorithm.

1 18. The golf club of claim 1, further comprising a mode switching mechanism  
2 adapted to enable a user to select between a training mode in which the 6DOF inertial  
3 measurement unit and the microprocessor are engaged and a competition mode in which  
4 the 6DOF inertial management unit and the microprocessor are disengaged.

1 19. The golf club of claim 18, wherein the mode selection device comprises a switch.

1 20. The golf club of claim 1, wherein the 6DOF inertial measurement unit and the  
2 microprocessor are rigidly fixed within the head of the golf club.

1 21. The golf club of claim 1, wherein the physical properties of the 6DOF inertial  
2 measurement unit, the microprocessor, and the head of the golf club comply with rules of  
3 golf promulgated by the United States Golf Association and The Royal and Ancient Golf  
4 Club of St. Andrews.

1 22. The golf club of claim 1, wherein the microprocessor is further configured to  
2 initialize an inertial reference frame using a gravity vector.